User's Guide

Fiber Optic Power/Wavehead
OMH-6745B

ILX Lightwave
Photonic Test & Measurement Instrumentation

ILX Lightwave Corporation · P. O. Box 6310 · Bozeman, MT, U.S.A. 59771 · U.S. & Canada: 1-800-459-9459 · International Inquiries: 406-586-1244 · Fax 406-586-9405
E-mail: support@ilxlightwave.com
www.ilxlightwave.com

70023001_R02_10_04

TABLE OF CONTENTS

Table of Contents i

List of Figures and Tables v

Safety and Warranty Information vii

Safety Information and the Manual vii

General Safety Considerations vii

Safety Symbols viii

Safety Marking Symbols viii

Warranty ix

Comments, Suggestions, and Problems xi

Chapter 1 Introduction and Specifications

Product Overview 1

Safety Considerations 1

Available Options and Accessories 2

Specifications 3

Chapter 2 Operation

Installation 7

Power-Up 8

Front Panel Controls 8

Unused Functions 9

Error Display 9
Rear Panel Connections 9
Input Connector 9
Analog Output 10
General Operating Procedures 10
Warm-up and Environmental Considerations 10
Fiber Optic Cable Considerations 10
Fiber Optic Connector Options 10
Measuring or Setting the Wavelength 11
Zeroing 11
User Calibration 12
Installing Different Fiber Optic Connectors 12
Care and Maintenance 12
Cleaning 13

Chapter 3 Command Reference

Common Commands 15
Device-Dependent Commands 15
Error Messages 16
Programming Examples 16

Chapter 4 Calibration

Calibration Overview 19
Recommended Equipment 19
Warm-Up 19
Manual Operation User Calibration 20
Remote (GPIB) Operation User Calibration 20
Programming a Fixed Offset to Wavelength and Power Measurements . . . 21
Resetting the User Calibration 21

Chapter 5 Troubleshooting

Introduction 23

Troubleshooting Guide 23

LIST OF FIGURES

Figure 2.1 OMM-6810B Front Panel 8
Figure 2.2 Rear Panel Input 9
Figure 2.3 Power Analog Out 10
Figure 2.4 Wavelength Setting 11
Figure 3.1 Command Path Structure 18

SAFETY AND WARRANTY INFORMATION

The Safety and Warranty Information section provides details about cautionary symbols used in the manual, safety markings used on the instrument, and information about the Warranty including Customer Service contact information.

Safety Information and the Manual

Throughout this manual, you will see the words *Caution* and *Warning* indicating potentially dangerous or hazardous situations which, if not avoided, could result in death, serious or minor injury, or damage to the product. Specifically:

CAUTION

Caution indicates a potentially hazardous situation which can result in minor or moderate injury or damage to the product or equipment.

WARNING

Warning indicates a potentially dangerous situation which can result in serious injury or death.

WARNING

Visible and/or invisible laser radiation. Avoid direct exposure to the beam.

General Safety Considerations

If any of the following conditions exist, or are even suspected, do not use the instrument until safe operation can be verified by trained service personnel:

- Visible damage
- Severe transport stress
- Prolonged storage under adverse conditions
- Failure to perform intended measurements or functions

If necessary, return the instrument to ILX Lightwave, or authorized local ILX Lightwave distributor, for service or repair to ensure that safety features are maintained (see the contact information on page xi).

All instruments returned to ILX Lightwave are required to have a Return Authorization Number assigned by an official representative of ILX Lightwave Corporation. See Returning an Instrument on page ix for more information.

SAFETY SYMBOLS

This section describes the safety symbols and classifications.

Technical specifications including electrical ratings and weight are included within the manual. See the Table of Contents to locate the specifications and other product information. The following classifications are standard across all ILX Lightwave products:

- Indoor use only
- Ordinary Protection: This product is NOT protected against the harmful ingress of moisture.
- Class I Equipment (grounded type)
- Mains supply voltage fluctuations are not to exceed ±10% of the nominal supply voltage.
- Pollution Degree II
- Installation (overvoltage) Category II for transient overvoltages
- Maximum Relative Humidity: <80% RH, non-condensing
- Operating temperature range of 0 °C to 40 °C
- Storage and transportation temperature of –40 °C to 70 °C
- Maximum altitude: 3000 m (9843 ft.)
- This equipment is suitable for continuous operation.

Safety Marking Symbols

This section provides a description of the safety marking symbols that appear on the instrument. These symbols provide information about potentially dangerous situations which can result in death, injury, or damage to the instrument and other components.

Caution, refer to manual	Earth ground Terminal	Alternating current	Visible and/or invisible laser radiation
Caution, risk of electric shock	Protective Conductor Terminal	Caution, hot surface	Frame or chassis Terminal
or (I) On: In position of a bistable push control. The slash (I) only denotes that mains are on.		or (O) Off: Out position of a bistable push control. The circle (O) only denotes that mains are off.	

WARRANTY

ILX LIGHTWAVE CORPORATION warrants this instrument to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period, ILX will repair or replace the unit, at our option, without charge.

Limitations

This warranty does not apply to fuses, lamps, defects caused by abuse, modifications, or to use of the product for which it was not intended**.**

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for any particular purpose. ILX Lightwave Corporation shall not be liable for any incidental, special, or consequential damages**.**

If a problem occurs, please contact ILX Lightwave Corporation with the instrument's serial number, and thoroughly describe the nature of the problem.

Returning an Instrument

If an instrument is to be shipped to ILX Lightwave for repair or service, be sure to:

1. Obtain a Return Authorization number (RA) from ILX Customer Service.
2. Attach a tag to the instrument identifying the owner and indicating the required service or repair. Include the instrument serial number from the rear panel of the instrument.
3. Attach the anti-static protective caps that were shipped with the instrument and place the instrument in a protective anti-static bag.
4. Place the instrument in the original packing container with at least 3 inches (7.5 cm) of compressible packaging material. **Shipping damage is not covered by this warranty.**
5. Secure the packing box with fiber reinforced strapping tape or metal bands.
6. Send the instrument, transportation pre-paid, to ILX Lightwave. Clearly write the return authorization number on the outside of the box and on the shipping paperwork. ILX Lightwave recommends you insure the shipment.

If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

Repairs are made and the instrument returned transportation pre-paid. Repairs are warranted for the remainder of the original warranty or for 90 days, whichever is greater.

Claims for Shipping Damage

When you receive the instrument, inspect it immediately for any damage or shortages on the packing list. If the instrument is damaged, file a claim with the carrier. The factory will supply you with a quotation for estimated costs of repair. You must negotiate and settle with the carrier for the amount of damage.

Comments, Suggestions, and Problems

To ensure that you get the most out of your ILX Lightwave product, we ask that you direct any product operation or service related questions or comments to ILX Lightwave Customer Support. You may contact us in whatever way is most convenient:

Phone . . . . . (800) 459-9459 or (406) 586-1244

Fax . . . . . (406) 586-9405

On the web at: . . . . . ilx.custhelp.com

Or mail to:

ILX Lightwave Corporation
P. O. Box 6310
Bozeman, Montana, U.S.A 59771
www.ilxlightwave.com

When you contact us, please have the following information:

Model Number: _____

Serial Number: _____

End-user Name: _____

Company: _____

Phone: _____

Fax: _____

Description of what is connected to the ILX Lightwave instrument: _____

Description of the problem: _____

If ILX Lightwave determines that a return to the factory is necessary, you are issued a Return Authorization (RA) number. Please mark this number on the outside of the shipping box.

You or your shipping service are responsible for any shipping damage when returning the instrument to ILX Lightwave; ILX recommends you insure the shipment. If the original shipping container is not available, place your instrument

in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

We look forward to serving you even better in the future!

CHAPTER 1

INTRODUCTION AND SPECIFICATIONS

This manual contains operation and maintenance information for the OMH-6745B Fiber Optic Power/Wavehead. The OMH-6745B must be used in conjunction with the OMM-6810B Optical Multimeter. To get started immediately, read Appendix B of the OMM-6810B Instruction Manual first.

Product Overview

The OMH-6745B Fiber Optic Power/Wavehead, when coupled to an OMM-6810B Optical Multimeter, provides the capability to accurately measure the power and wavelength of laser sources between 950 and 1650 nm. The OMH-6745B is calibrated to NIST traceable power and wavelength standards to ensure accuracy.

Quick setup, a two meter cable and a robust design makes the OMH-6745B Fiber Optic Power/Wavehead easy to integrate into any fiber optic experiment or measurement. The instrument can be integrated with other equipment via the optional GPIB/IEEE-488.2 interface.

Safety Considerations

Care must be exercised when handling fiber optic cables. Direct viewing of the (sometimes invisible) fiber optic output can produce retinal or corneal damage. Absorption of the laser light by the eye causes localized heating and denaturing of tissue proteins. The ANSI publication Z-136.1, “The Safe Use of Laser”, lists Maximum Permissible Exposure (MPE) levels for direct, or intrabeam viewing of laser beams. From the MPE levels, a “hazard zone” may be computed for a particular laser and exposure time.

For more information concerning laser and laser diode safety, contact the Center for Devices and Radiological Health or ILX Lightwave.

WARNING

Refer Servicing only to qualified, authorized personnel.

Available Options and Accessories

The OMH-6745B must be coupled to the OMM-6810B Optical Multimeter. Other options and accessories available with the OMM-6810B are listed in the instruction manual included with your 6810B.

Specifications

The Electro-Optic performance specs for the OMH-6745B when coupled to the OMM-6810B Optical Multimeter are described below. All parameters are measured at 25 °C.

Input Specifications	
Power Range (manual wavelength mode)	10 nW to 100 mW; (-50 dBm + 20 dBm)
Power Measurement Accuracy At reference conditions[3] Total[4]	 ±2.5% (λ = 950 - 1500 nm) ±3.0% (λ = 950 - 1500 nm)
Stability3 10 minutes 24 hours	 0.003 dB 0.010 dB
Wavelength Range	950 to 1650 nm
Power Range[5] (auto wavelength mode)	1 μW to 100 mW (-30 dBm to +20 dBm)
Polarization Dependency	≤0.01 dB @ 1550 nm, ≤0.006 dB @ 1310 nm
Wavelength Measurement Accuracy	±0.5 nm
Wavelength Temperature Coefficient	< ±0.03 nm/°C
Power Temperature Coefficient	< 0.0004 dB/°C
Wavelength Linearity w/Power Change	< ±0.5 nm
Sampling Rate	
Slow	16 samples @ 60 ms / sample
Medium	4 samples @ 60 ms / sample
Fast	1 sample @ 60 ms / sample
Input Bandwidth	
Slow	1 Hz
Medium	10 Hz
Fast	60 Hz
Analog Output Specifications	
Analog output representing the power measurement is available at the rear panel of the multimeter. Refer to the OMM-6810B Instruction Manual for details.	

Display	
Left Display (Power Display)	
Units Linear Power Log Power	 pW, nW, µW, mW, W, ΔP dBm, dB
Range Linear Power Log Power	 0.000 nW to 999.999 W -99.999 to 99.999 dBm / dB
Resolution (Slow Update Rate) Linear Power Log Power	 0.001 pW 0.001 dB
Resolution (Medium / Fast Update Rate) Linear Power Log Power	 0.01 pW 0.01 dB
Right Display (Wavelength Display)	
Units Range Resolution	nm, cm^{-1}, Δλ 950.0 to 1650.0 nm .1 nm, .1 cm^{-1}
Bargraph	Represents the percent of full scale power within the selected gain range
Brightness	5 settings incrementally spaced from dark to brightest
General Specifications	
Operating Temperature	+ 15 °C to +35 °C
Storage Temperature	-40 °C to +70 °C
Humidity (non-condensing)	< 70% RH, non-condensing, input power <10 uW < 85% RH, non-condensing, input power ≥10 uW
Overall Dimensions	51 mm x 64 mm x 102 mm
Weight	< 0.5 kg
Fiber Input Adapters Available	FC, SC, ST, Biconic, Diamond HMS-10, Radiall VFO-DF, NEC D4, Radiall-EC, DIN 47256/4108, Bare fiber to FC
Connector to Main Unit[3]	26 pin high-density sub-D

3.Reference Conditions: (Add 0.5% for λ - 1500 nm to 1650 nm)
- Power level -20 dBm, CW
- 550 um step index fiber, NA = 0.22
- Ambient temperature 23± 5°C
- AT&T ST connector
- Spectral source width < 10 nm

4.Under the following conditions: (Add 0.5% for λ - 1500 nm to 1650 nm)
- Fiber ≤ 200 um, NA ≤ 0.37
- Ambient temperature 0 to 55 °C, non-condensing
- Seiko FC/PC connector
- Spectral width < 10 nm

5.Minimum optical power to obtain accurate wavelength measurement
- 1 uW (1200 nm - 1650 nm)
- 10 uW (950 nm - 1200 nm)

6.An antistatic cover is included on the connector to the Multimeter. To prevent damage from electro-static discharge, this cover should remain in place when the Optical Measurement Head is not connected to the Multimeter.

Our goal is to design and produce the best optical test equipment available anywhere. To achieve this, we need your ideas and comments on ways we can improve out products. We invite you to contact us at any time with your suggestions.

CHAPTER 2

OPERATION

This chapter describes how to install and operate the OMH-6745B Fiber Optic Power/WaveHead in conjunction with a OMM-6810B Optical Multimeter. It is divided into sections covering installation, power-up, front panel and rear panel controls, and general operation. A detailed familiarization of the main unit features are presented in Chapter 2 of the OMM-6810B Instruction Manual.

Installation

The OMH-6745B must be connected to the OMM-6810B. Make sure the power to the Multimeter is turned off then connect the cable from the 6745B to the INPUT connector on the rear panel of the multimeter.

WARNING

Do not attach or remove the power head while power is applied to the Multimeter. Please turn the power switch off when changing heads.

WARNING

To avoid electrical shock hazard, connect the meter to a properly earth grounded, three prong receptacle only. Failure to observe this precaution can result in severe injury or death.

Power-Up

Connect the main unit to an AC power source. Press the POWER switch to supply power to the device and start the power-up sequence.

The power-up sequence takes about six seconds. Initially, all LEDs and enunciators are illuminated and the seven-segment displays denote "8". Then, all LEDs and the displays are turned off while the microprocessor executes a device self-test. Should the self test fail, the error message E-720 is displayed. The meter then loads personality and calibration data from the measurement head. The left display indicates -6745- and the firmware version is shown on the right display. If an error occurs while loading data, message E-711 is displayed. If an incompatible head is connected, E-713 is displayed. If a measurement head is not connected both displays show "------" until a head is attached.

At power up the main unit is configured to the same state that was present when the power was last turned off.

Front Panel Controls

The OMM-6810B/OMH-6745B is intuitively operated from the front panel keypad, indicator LEDs and dual displays. A drawing of the front panel is shown in Figure 2.1. Front panel functions which are not available with the OMH-6745B are outlined later in this chapter.

Refer to the OMM-6810B Instruction Manual for descriptions of each front panel switch function.

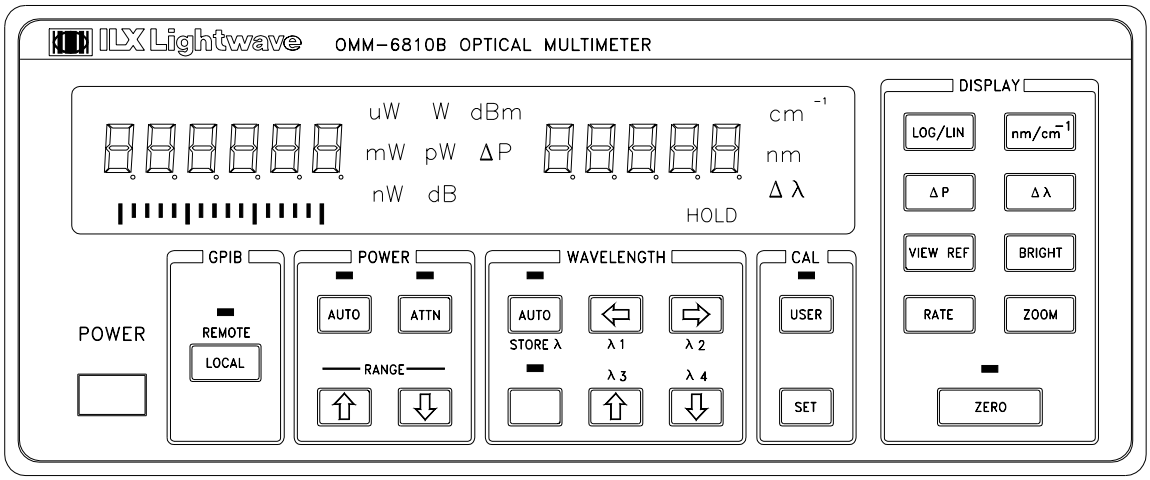
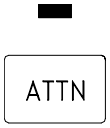


Figure 2.1 OMM-6810B Front Panel

Unused Functions

The Multimeter function that is not utilized (disabled) when the OMH-6745B Fiber Optic Power/Wavehead is attached are shown to the right. If a disabled button is pushed, the 6810B will display the error code E-715.



All other switch functions perform as described in the OMM-6810B Instruction Manual.

Error Display

Execution errors are indicated on the right display. Errors are shown as "E-xxx" where xxx is a three digit number representing the unique error. Errors are displayed for three seconds or until the error causing condition is remedied, whichever is longer. See Appendix A in the OMM-6810B Instruction Manual for a detailed list of error messages.

Rear Panel Connections

The OMH-6745B interfaces with the rear panel of the multimeter as described in the following paragraphs.

Input Connector

The OMH-6745B Fiber Optic Power/Wavehead interfaces the main unit via the 26-pin high density “D” connector located on the lower left side of the rear panel. Do not attach or remove the head while power is applied to the Optical Multimeter. Please turn the power switch off when changing optical measurement heads.

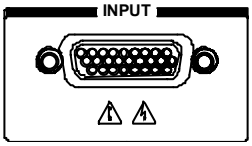


Figure 2.2 Rear Panel Input

Analog Output

Analog output representing the power measurement is located in the upper left corner of the 6810B rear panel.

The **POWER ANALOG OUT** is a non-calibrated value between 0 and 10 volts representing the measured power as a percent of full scale power within the selected gain range. For example, if the full scale power for gain range three is 10 µW and the displayed power is 5.000 µW, then 5.0 volts is present on the **POWER ANALOG OUT** connector.

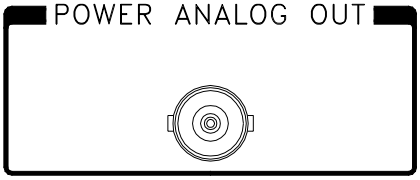


Figure 2.3 Power Analog Out

General Operating Procedures

The following sections present some guidelines for operating the OMM-6810B with the OMH-6745B. More detailed instructions are found in the OMM-6810B Instruction Manual. Remote operation is discussed in Chapter 4.

Warm-up and Environmental Considerations

The main unit and Measurement Head should operate at an ambient temperature between 10 and 35 °C and a relative humidity less than 70%. Storage temperatures should be between -40 and +70 °C, To achieve rated stability, let both devices warm up for at least one hour.

Fiber Optic Cable Considerations

The OMH-6745B is designed to provide a simple operating format. Be certain the fiber ferrule is clean and free from debris before inserting into the input adapter. Input fiber connectors should be properly seated within the input adapter and the fiber should be secured to the bench for best accuracy.

Fiber Optic Connector Options

Several connectors are available for the 6745B. Compatible connector types include FC, SC, ST, Diamon HMS-10, NEC D4, Radiall VFO-DF, Radiall-EC, DIN

47256-/4108, Biconic and bare fiber to FC. ILX also offers a special fitting to accomodate Hewlett Packard 81000 series connectors.

Measuring or Setting the Wavelength

For automatic wavelength compensation of power measurements press the WAVELENGTH AUTO button so that the indicator above the button is lit. The wavelength of the source can also be manually programmed into the 6810B using the procedure below.

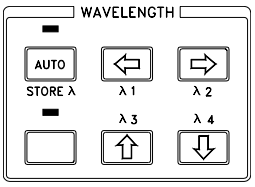
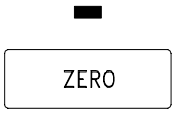


Figure 2.4 Wavelength Setting

- Use the WAVELENGTH **LEFT** and **RIGHT** arrow buttons to select the digit on the WAVELENGTH display that will be controlled by the WAVELENGTH **UP** and **DOWN** arrow buttons. The selected digit will flash.
- Use the WAVELENGTH **UP** and **DOWN** arrow buttons to increment or decrement the selected digit. If no buttons are pressed in three seconds, the displayed wavelength will be locked in and the digit will stop flashing.
- Commonly used wavelengths may be stored or retrieved by using the WAVELENGTH BLUE SHIFT, **STORE** λ, λ1 ,λ2 ,λ3, and λ4 buttons as described in Chapter 2 of the OMM-6810B manual.

Zeroing

The DISPLAY **ZERO** function is used to remove the effects that ambient light has on the power measurement. It is important to zero the multimeter with the OMH-6745B attached before taking measurements. This is especially true for low input power applications or in cases of high ambient light intensity.



Pressing the DISPLAY **ZERO** button when the LED above the DISPLAY **ZERO** button is not lit starts the zeroing process. While zeroing the "0" digit *walks* across both displays, the LED above the DISPLAY **ZERO** indicator flashes. Pressing the DISPLAY **ZERO** button when the DISPLAY **ZERO** indicator is illuminated disables the effects of the zero. The procedure for zeroing the instrument is described below.

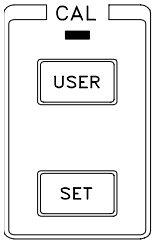
- The fiber should be secure to the adapter and the source should either be blocked or turned off.
- If the LED above the DISPLAY **ZERO** indicator is illuminated, press the DISPLAY **ZERO** button once to disable the existing compensation factors.

- Press the DISPLAY **ZERO** button. While zeroing, the "0" digit *walks* across the display and the DISPLAY **ZERO** indicator above the button flashes. When zeroing is complete the DISPLAY **ZERO** button is lighted. The process takes about 10 seconds.
- Turn the source on. Accurate power measurements are displayed.

  Note: If the ambient environmental conditions change (e.g. the room lights are turned on or off or the attenuator is added or removed), the instrument must be re-zeroed to maintain its accuracy.
- Pressing the DISPLAY ZERO button again disables the compensating factors and the LED above the DISPLAY ZERO button is turned off.

User Calibration

It is possible to calibrate the OMM-6810B/OMH-6745B using a laser source of known power and wavelength. Pressing the CAL **USER** button to toggles the instrument in and out of the User Calibration Mode. When the LED above the CAL **USER** button is lighted, the unit employs the user defined calibration which has been stored in the Optical Measurement Head. Pressing the CAL **USER** button when the CAL USER LED is lit causes the instrument to revert to factory calibration and the LED to go out. Pressing the CAL **SET** button while the LED above the CAL **USER** button is lighted initiates the user calibration procedure.



Installing Different Fiber Optic Connectors

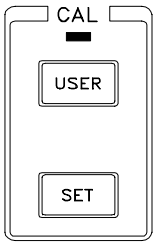
All connectors used on the 6745B are simple threaded “caps”. To change the connector simply unscrew it from the detector housing and replace it with the desired connector cap. Excessive fource should not be used when tightening the connector caps to the detector mount. When the 6745B is not in use, the front cover cap should be in place to prevent accumulation of particles or debris within the head assembly.

Care and Maintenance

The design of the Measurement Head is fairly robust, however it should be handled with care. Stress from dropping the Head or other mishandling could dislodge critical alignments within the Head, effectively changing its response and nullifying its calibration. It is also sensitive to electrostatic discharge. When not in use, replace the ESD-protective cap that came with the Head on the D connector and store the Head in the ESD-safe bag.

Cleaning

In general, avoid cleaning the interior of the Measurement Head, **especially by blowing into it or by using compressed air.** If minor dust or other particulates have entered the input aperture**,** remove the contaminant using canned air or dry nitrogen. Use short bursts while holding the head such that the aperture is directed downward.


CAL
USER
SET

CHAPTER 3

COMMAND REFERENCE

This chapter is a guide to the usage of the device-dependent GPIB commands for the OMM-6810B Optical Multimeter when the OMH-6745B Fiber Optic Power/Wavehead is attached. This chapter is of primary interest to users who wish to utilize the GPIB option. A complete reference describing the syntax and usage of each device-dependent command is provided in Chapter 4 of the OMM-6810B Instruction Manual.

Common Commands

The GPIB Common Commands which are defined by the ANSI/IEEE-488.2-1987 standard are described in Chapter 3 of the 6810B Instruction Manual. These commands do not necessarily reflect front panel operations and are not unique to the measurement head connected to the meter. In other words, the common commands listed in the 6810B Instruction Manual are all valid when using the OMH-6745B.

Device-Dependent Commands

Chapter 4 of the OMM-6810B Instruction Manual contains the complete set of device-dependent GPIB commands. Table 3.1 on the next page outlines the subset of commands which are valid when the OMH-6745B Fiber Optic Power / Wavehead is attached. The command path tree structure is illustrated in Figure 3.1.

Note: The usage and syntax of each device dependent command is best described in Chapter 4 of the OMM-6810B Optical Multimeter Instruction Manual.

Error Messages

Error messages may appear on the right display. In remote operation, the current error list can be read by issuing the ERR? query. When this is done, a string is returned containing the previously unread error messages (up to ten). When the error queue is active, bit #7 of the Status Byte is also set to one.

Appendix A of the OMM-6810B Instruction Manual contains an explanation of the error messages which may be reported by the 6810B on the display or via remote operation.

Programming Examples

Examples of programming the 6810B via GPIB are shown in the 6810B Instruction Manual, Chapter 4.

Command Name	# Parameters Expected	Description
BRIght	1	Sets the brightness of the front panel
BRIght?	None	Returns the level of the display brightness
CAL: POWERSET	2	Sets the user calibration power
CAL: RECall	None	Resets the user calibration
CAL:USER	None	Starts the user calibration
COND?	None	Returns the condition status register
ENAB:COND	1	Sets the enable register for conditions
ENAB:COND?	None	Returns the condition enable register
ENAB:EVENT	1	Sets the enable register for events
ENAB:EVENT?	None	Returns the event enable register
ERRors?	None	Returns errors generated since last ERR?
EVEnt?	None	Returns the event status register
HEAD:IDN?	None	Returns the head identification string
HOLD?	None	Returns the hold status
POWer?	None	Returns the power measurement
POWer:AUTO	1	Sets the power autoranging mode on or off
POWer:AUTO?	None	Returns the status of power autoranging
POWer:MODE	2	Sets the power display units
POWer:MODE?	None	Returns the power display units
POWer:OFFSET	1	Sets the power offset multiplier
POWer:OFFSET?	None	Returns the power offset multiplier

POWer:REFerence	2	Sets the reference for ΔP measurements
POWer:REFerence?	None	Returns the power reference level
PREselect:CHAN	1	Selects on of four preselected wavelengths
PREselect:CHAN?	None	Returns the preselected wavelength channel being used
PREselect:SAVE	2	Sets one of the four preselected wavelengths
RANge	1	Sets the gain range (manual)
RANge?	None	Returns the gain range (auto/manual)
RANge:AUTO	1	Sets the autoranging mode on or off
RANge:AUTO?	None	Returns the status of the autoranging
RATE	1	Sets the measurement rate
RATE?	None	Returns the measurement rate string
SECURE	1	Used by service personnel to access PUD
TERM	1	Sets the program message terminator
TERM?	1	Returns the program message terminator
TIME?	None	Returns elapsed time since power up
TIMER?	None	Returns elapsed time since last TIMER?
WAVE	2	Sets the wavelength
WAVE?	None	Returns the set wavelength
WAVE:AUTO	1	Sets the auto wavelength feature on or off
WAVE:AUTO?	None	Returns the set or measured wavelength
WAVE:MODE	1	Sets the wavelength display units
WAVE:MODE?	None	Returns the wavelength display units
WAVE:OFFSET	2	Sets the wavelength offset
WAVE:OFFSET?	None	Returns the wavelength offset
WAVE:REFerence	2	Sets the reference for λΔmeasurements
WAVE:REFerence?	None	Returns the wavelength reference point
ZERO	None	Starts the zeroing function
ZERO?	None	Returns the status of the zeroing.

Table 3.1 Device-Dependent Commands valid with the OMH-6745B

Command Name	# Parameters Expected	Description
ATTen	1	Enables/disables the attenuation function
ATTen?	None	Returns the status of the attenuator

Table 3.2 Device-Dependent Commands which are not usable with the OMH-6745B

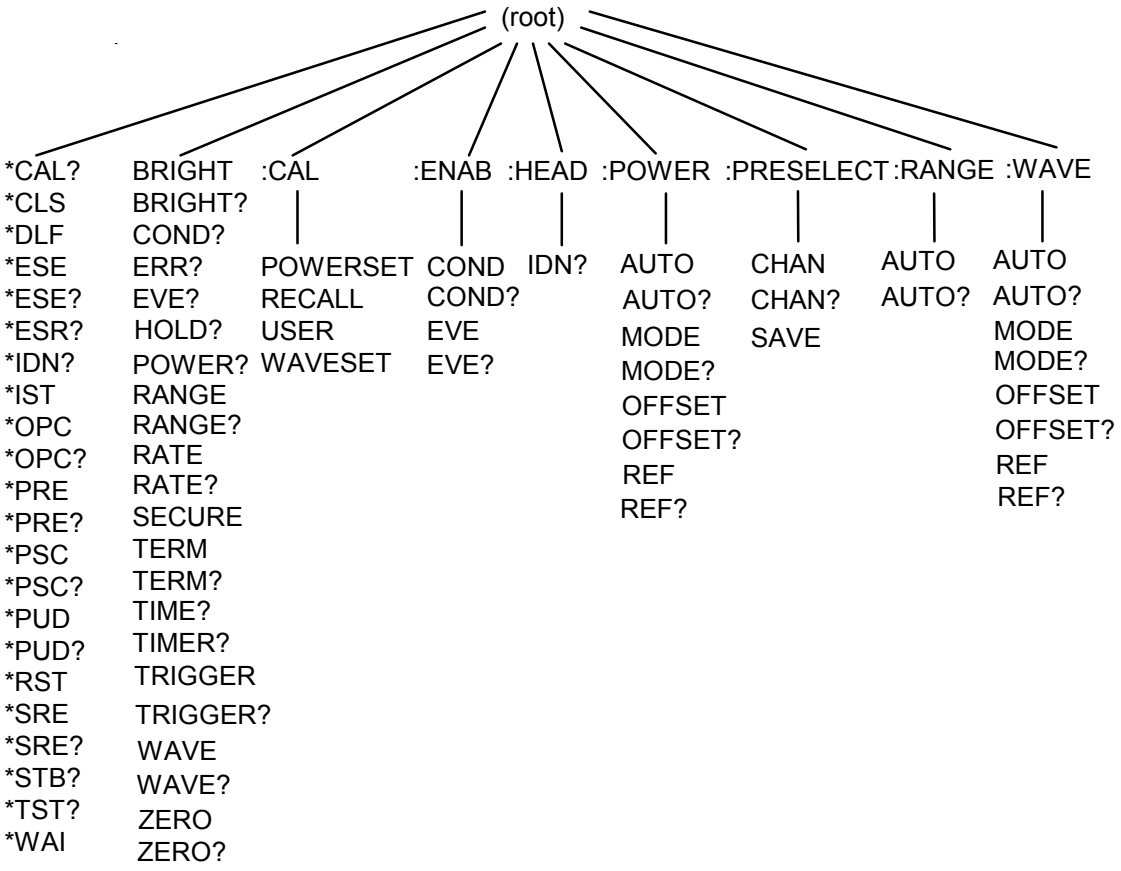


Figure 3.1 Command Path Structure

CHAPTER 4

CALIBRATION

This chapter describes how to calibrate the OMH-6745B Fiber Optic Power/Wavehead.

The OMH-6745B Fiber Optic Power/Wavehead has been sealed to protect internal components from damage and to maintain the factory calibration. Do not attempt to disassemble the head.

Calibration Overview

It is possible to calibrate the OMH-6745B using a source of known power and wavelength. Calibrate the 6745B whenever performance verification indicates that calibration is necessary. The wavelength calibration consists of one point which shifts future measurements by the amount of the calibration. The power calibration consists of one point which changes future power measurements by the percentage calculated during the calibration.

Recommended Equipment

It is recommended that gas-line sources or spectral lamps with the proper line isolation filters be used for calibration. Laser diodes are not recommended, however, an extremely stable laser diode may be used if it is lasing in a single mode and the wavelength is first measured with a calibrated optical spectrum analyzer or wavelength meter.

Warm-Up

Before attempting calibration, the OMH-6745B should be allowed to warm up for at least 1 hour after being connected to the main unit.

Manual Operation User Calibration

Front Panel execution of the User Calibration using the OMM-6810B is described in the procedure below:

- Identify ambient conditions and zero the instrument as described in Chapter 2.
- Connect via fiber optic a laser of known wavelength and power into the OMH-6745B.
- Start the calibration by pressing the CAL **USER** button to place the unit in User Calibration Mode. The LED above the CAL **USER** button will light. Press the CAL **SET** button to initiate the User Calibration Procedure. The left display will show "**CAL-**λ".
- The measured wavelength is shown on the left display. Adjust the displayed power to match the laser's known wavelength using the WAVELENGTH **LEFT** and **RIGHT** buttons to select a digit and then use the WAVELENGTH **UP** or **DOWN** button to change the wavelength.
- Press the CAL **SET** button to complete the wavelength calibration.
- The right display will now indicate "**CAL-P**". The measured power will be shown on the left display. Adjust the displayed power to match the laser's known power using the POWER **UP** and **DOWN** arrow buttons. If large adjustments are necessary, hold down the **UP** or **DOWN** button to accelerate the change.
- Press the CAL **SET** button to complete the calibration. The unit returns to real time wavelength and power measurements.

Remote (GPIB) Operation User Calibration

Remote controlled User Calibration is described in the following procedure. It may help to be familiar with the manual calibration procedure listed above before attempting it remotely.

- Identify ambient conditions. Block the laser beam from striking the detector of the OMH-6745B.
- Start the calibration by clearing the status registers, then zeroing the instrument by issuing the following GPIB commands:

  *CLS

  RANGE:AUTO ON

  ZERO

- Wait for the zero to finish. The controlling software can monitor the status of zeroing by sending the following query in a loop. Exit the loop when the response is '1'.

  ZERO?

- Launch a laser of known wavelength and power at the detector of the 6745B. Start the calibration by sending the following commands.

  CAL:USER ON

  CAL:USER START

- Enter the known wavelength using the command:

  CAL:WAVESET xxxx.xx ss

  where, **xxxx.xx** is the known wavelength and **ss** is the units (µm, nm or cm).

- Enter the known power using the command:

  CAL:POWERSET xxxx.xx ss

  where, **xxxx.xx** is the known power and **sss** is the suffix units (pw, nw, uW, mw, w or dbm).

- The calibration is complete and the 6810B is performing real time power measurements.

Programming a Fixed Offset to Wavelength and Power Measurements

Rather than performing a User Calibration, it is possible to enter offset values which are applied to future wavelength and power measurements. For more information, refer to the **POWER:OFFSET** and **WAVE:OFFSET** GPIB commands in Chapter 4 of the OMM-6810B Instruction Manual.

Resetting the User Calibration

The User Calibration is preset at the factory. The factory preset calibration can be restored by pressing the CAL **USER** button so that the CAL **USER** indicator is off or by sending the GPIB command **CAL:USER OFF**.

CHAPTER 5

TROUBLESHOOTING

Introduction

This chapter is intended to be used as a guide when the OMM-6810B and OMH-6745B do not perform as expected. It is not a service manual, rather a guide to alleviate basic problems which may arise during operation. A more complete guide, including a GPIB troubleshooting guide, is provided in Chapter 7 of the OMM-6810B Instruction Manual.

Troubleshooting Guide

If you have difficulty using the 6745B, refer to the symptoms listed here. Common causes and corrective actions are listed here. If problems persist, contact your ILX Lightwave representative at (406) 586-1244.

Symptom	Causes and Corrective Actions
Measurement will not stabilize	• The OMH-6745B is designed to accurately measure the wavelength of a CW source with an amplitude instability of up to 40% depth of modulation. Ensure the laser source's wavelength is stable and that any modulation is minimized. This condition may occur if the laser has not warmed up. Most gas laser cavities expand when first turned on which can cause intensity and wavelength fluctuations. • Check for tight connects between the main unit and the 6745B and ensure other "noisy" electronic devices are not located near the head. • In cases of low input power and/or high background light, try working in a dark environment and be sure to zero the instrument as described in Chapter 2.
Display shows "-----"	• The 6745B is not connected to the Multimeter.
Display shows "HI-P"	• This condition occurs when the laser's input power exceeds the maximum allowed for the selected gain range. Measurements at this level are invalid. If in manual mode, press the **DOWN** switch to select the next lower gain range.

Display shows “HI-λ”	• This condition occurs when the instrument interprets the laser’s wavelength as greater than 1650 nm which is beyond the capability of the OMH-6745B.
Display shows “LO-λ”	• This condition occurs when the instrument interprets the laser’s wavelength as less than 950 nm which is beyond the capability of the OMH-6745B.
Measurements are not accurate at a known wavelength or power standard	• Be certain the zeroing procedure has been performed correctly as described in Chapter 2. • It may be necessary to perform the User Calibration.
Measurement seems erratic with a pulsed source input	• Change update rates. Best results with pulsed sources are usually in the **SLOW** update rate. • Work in **MANUAL** gain ranging mode. The **AUTORANGING** algorithm may have difficulty with some pulsed sources, espeically those with duty cycles less than 50%.